

NEW CAVERNICOLOUS SPECIES OF *KLEPTOCHTHONIUS*, AND RECOGNITION OF A NEW SPECIES GROUP WITHIN THE GENUS (*PSEUDOSCORPIONIDA: CHTHONIIDAE*)¹

William B. Muchmore²

ABSTRACT: Three new species of *Kleptochthonius* (*Chamberlinochthonius*) are described from caves in extreme southwestern Virginia and adjacent northeastern Tennessee. A new group of species in the subgenus is recognized on the basis of the size and location of a newly observed sensory seta.

DESCRIPTORS: Pseudoscorpionida; Chthoniidae; *Kleptochthonius*; *Chamberlinochthonius*; sensory seta; cavernicolous; Virginia; Tennessee.

Recently, while studying several *Kleptochthonius* collected from caves in southwestern Virginia by J.R. Holsinger and his associates, my colleague, C.H. Alteri, noticed a taxonomic character which had heretofore been unrecognized — this is a short, stout seta, apparently sensory in function, on the medial surface of the fixed finger of the palpal chela. Reexamination of all available material of the genus and restudy of the types of most *Kleptochthonius* (*Chamberlinochthonius*) species revealed that the presence, size and position of this seta are of systematic importance. While it will subsequently be used in the definition and diagnosis of species throughout the genus, it is here employed only to distinguish a new group among the cavernicolous *Kleptochthonius*.

Family Chthoniidae Hansen
Genus *Kleptochthonius* Chamberlin
Subgenus *Chamberlinochthonius* Vachon
- *proximasetus* Group

Muchmore (1965) discussed a grouping of species of *Kleptochthonius* (*Chamberlinochthonius*) based on the form of the process for muscle attachment on the base of the movable chelal finger. This grouping still seems reasonable. As presently known, the *henroti* Group consists of *K. henroti* (Vachon), *K. proserpinae* Muchmore and *K. hetricki* Muchmore, distinguished by the possession of a long, bifurcate process; the *krekeri* Group consists of *K. krekeri* Muchmore, *K. orpheus* Muchmore and perhaps *K. packardi* (Hagen), which possess a long, simple process; while the other 20 species of the subgenus, which have a short, more or less bifurcate process, have not been subdivided. It now appears that further partitioning is possible, using the size and position of a newly recognized sensory seta on the medial

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² Department of Biology, University of Rochester, Rochester, New York, 14627.

side of the fixed chelal finger. In most cavernicolous species of *Kleptochthonius* this seta is short and stout (Fig. 3) and has a hollow core; its position on the fixed finger is quite constant within a species but varies in different species from a level midway between trichobothria *est* and *ist* to just proximad of *ist* (see Figs. 2,4,5). In a few cavernicolous forms and in some epigean *Kleptochthonius*, the corresponding seta is longer and more slender (Fig. 6), but still noticeably different from typical vestitural setae; in other epigean forms it is apparently not present. The seta would appear to be a specialized sense organ important for animals of this genus which live down in the earth, either in caves or in deep, hypogean situations. No similar seta has yet been identified in any other chthoniid genus, including the closely related *Apochthonius*.

Several species of *Kleptochthonius* from extreme southwestern Virginia and adjacent northeastern Tennessee may be distinguished from others in the genus by the following combination of characters: representative of *Kleptochthonius* (*Chamberlinochthonius*), with a short, slightly bifurcate process for muscle attachment on the proximal end of the movable chelal finger, and with a short, stout, sensory seta on the medial side of the fixed chelal finger proximad of the level of trichobothrium *ist*. These may be called the *proximosetus* Group and include the species *K. proximosetus* Muchmore, new species, *K. affinis* Muchmore, new species, *K. similis* Muchmore, new species, *K. gertschi* Malcolm and Chamberlin (1961), *K. regulus* Muchmore (1970), and *K. binoculatus* Muchmore (1974). It seems obvious that these forms are closely related, probably derived from the same hypogean or epigean ancestor. Unfortunately no non-cavernicolous specimens of *Kleptochthonius* are available from this area of Virginia, Tennessee and adjacent Kentucky.

Key to species of the *proximosetus* Group

1. Tergites 1-6 each with 4 (or 3) setae 2.
Tergites 1-4 each with 4 setae, and tergites 5 and 6 each with 6 setae 4.
2. Cheliceral hand with 7 setae *proximosetus*, new species
Cheliceral hand with 9 or more setae 3.
3. With 4 eyes, distinct though weak *affinis*, new species
With no eyes *gertschi* Malcolm and Chamberlin
4. With 4 eyes, distinct through weak *similis*, new species
With only 2 eyes 5.
5. Larger species with more slender appendages – palpal femur longer than 1.2 mm, 1/w ratio greater than 7.3 *regulus* Muchmore
Smaller species with less slender appendages – palpal femur shorter than 0.95 mm, 1/w ratio less than 6.5 *binoculatus* Muchmore

Kleptochthonius (Chamberlinochthonius) proximisetus, new species

Figs. 1-3

Material: Holotype male (WM 3843.01001) and paratype female from Gallohan Cave No. 1, 7 miles SE Rose Hill, Lee County, Virginia, 28-XI-1974 (J. Holsinger, T. Kane, T. VanZant). Types are in the American Museum of Natural History, New York.

Diagnosis: A species of the *proximisetus* Group (see above), with distinguishing characters as noted in the key.

Description: Male and female similar except for sexual features and male with slightly more slender appendages. Carapace a little longer than broad; anterior margin slightly concave in middle and with small denticles laterally; no eyes present; chaetotaxy of holotype 6-4-4-2-3=19, of paratype 7-4-4-2-4=21. Coxal chaetotaxy 2-2-1-3-1-CS:2-2:2-3:2-3; with 5 or 6 spines on each coxa I. Abdominal tergal chaetotaxy of holotype 4:4:4:4:4:6:6:7:5:T2T:0; paratype similar. Sternal chaetotaxy of holotype male 13: [2-2]:(3) $\frac{9-10}{6}$ (3):(3)7(3):8:7:8:8:11:T1T1T1T:0:2; the figures in brackets, [2-2], in the formula refer to the long papillate openings of the lateral glands into the genital atrium – in chthoniids these were formerly referred to as “internal guard setae” (see Legg, 1974, p. 71). Sternal chaetotaxy of paratype female 9:(3)6(3):(3)8(3):9:8:8:10:11:T1T1T1T:0:2.

Chelicera as long as carapace; hand with 7 setae; fixed finger with about 12 teeth, movable finger with 1 large, isolated distally and a row of 7-8; spinneret a low elevation; flagellum of 8 pinnate setae.

Palp long and slender (Fig. 1); male with femur 1.95 and chela 2.8 times as long as carapace (female 1.7 and 2.5, respectively); male (female) with femur 7.55 (7.05), tibia 2.5(2.3), and chela 7.2(6.95) times as long as broad; hand 2.7(2.7) times as long as deep; movable finger 1.65(1.59) times as long as hand. Arrangement of trichobothria typical. A short, sensory seta on medial side of fixed finger just proximad of level of *ist* (Figs. 2,3). Fixed finger with 25-28 spaced, long, sharp macrodenticles and 13-18 pointed, microdenticles alternating distally; movable finger with about 15 spaced macrodenticles, about 12 alternating microdenticles, and about 14 contiguous, low, rounded teeth proximally. Movable finger with a small, double sensillum lateral to last macrodenticle. Proximal end of movable finger with a short, bifurcate process on dorsal side.

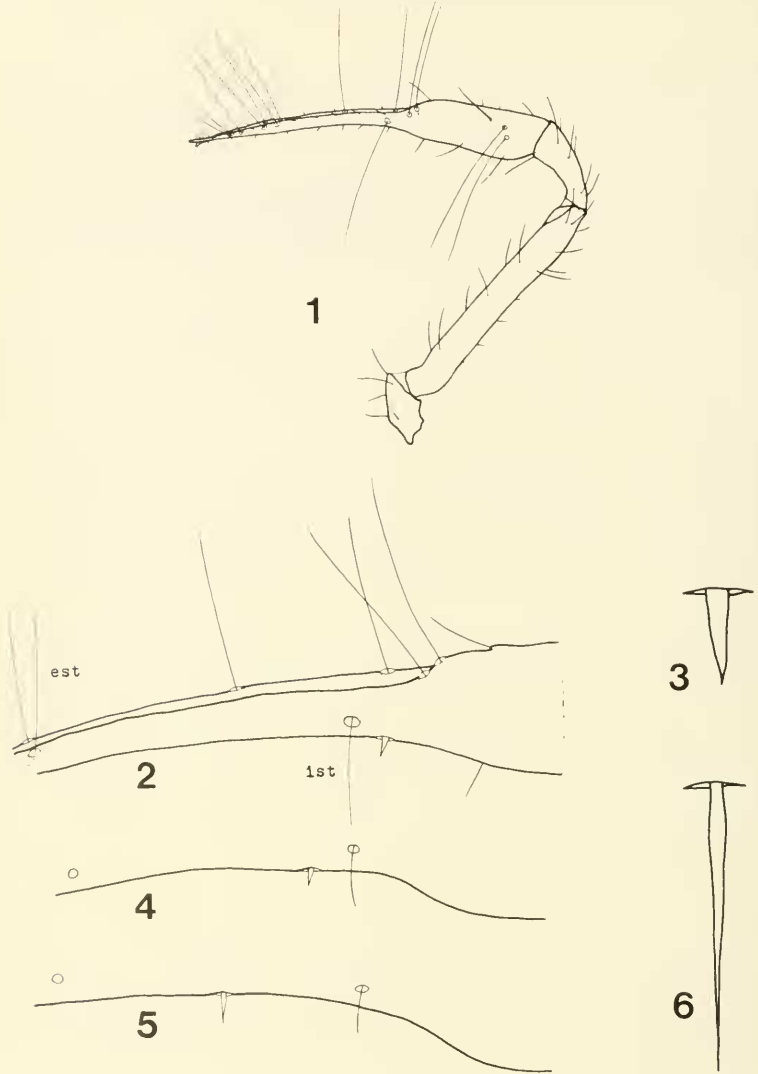
Legs slender; leg IV with entire femur 3.55-3.6 and tibia 5.9-6.0 times as long as deep.

Measurements (mm): First figures are for holotype male, with those for paratype female in parentheses. Body length 2.26(2.18). Carapace length 0.665(0.70). Chelicera 0.66(0.68) by 0.27(0.28). Palpal trochanter 0.35(0.36) by 0.18(0.18); femur 1.21(1.20) by 0.16(0.17); tibia 0.47(0.44) by 0.19(0.19); chela 1.73(1.74) by 0.24(0.25); hand 0.65(0.68) by 0.24(0.25); movable finger 1.07(1.08) long. Leg IV: entire femur 0.96(0.96) by 0.265 (0.27); tibia 0.65(0.66) by 0.11(0.11); metatarsus 0.33(0.33) by 0.10(0.10); telotarsus 0.78(0.78) by 0.07(0.07).

Etymology: The species is named *proximisetus* in recognition of the placement of the short, sensory seta on the fixed chelal finger proximad of the level of trichobothrium *ist*.

Remarks: This species and *K. similis* have been found in caves (Gallohan's and Sweet Potato) which are only about a mile apart. They are, nevertheless quite distinct as seen particularly in the development of the eyes and the number of setae on tergites 5 and 6.

The occurrence of 19 and 21 setae on the carapace of the types is



Figs. 1-3. *Kleptochthonius (C.) proximosetus*, new species: 1. Dorsal view of right palp; 2. Part of right chela showing position of sensory seta on medial side of fixed finger proximad of trichobothrium *ist*; 3. Enlarged view of sensory seta on fixed finger.

Fig. 4 *Kleptochthonius (C.) stygius* Muchmore. Medial margin of fixed finger showing position of sensory seta distad of trichobothrium *ist*.

Fig. 5 *Kleptochthonius (C.) tantalus* Muchmore. Medial margin of fixed chelal finger showing position of sensory seta far distad of trichobothrium *ist*.

Fig. 6. *Kleptochthonius (K.) crosbyi* (?). Sensory seta on fixed chelal finger, at same magnification as Fig. 3.

indicative of variation of this character in the species, the basic number undoubtedly being 20, as in other members of the group. Also, the occurrence of only 2 lateral gland openings on each side in the internal genitalia of the male is unusual; if the same situation occurs in other males of the species, then it is distinctive, as the usual number of these gland openings is 4 on each side.

Kleptochthonius (Chamberlinochthonius) affinis, new species

Fig. 7

Material: Holotype female (WM 3343.01001) from Chadwell's Cave, 3.5 miles NE Tazewell, Claiborne County, Tennessee, 10-VIII-1973 (J.R. Holsinger and D. Culver) and paratype female from English Cave, 8 miles NNE Tazewell, Claiborne County, Tennessee, 22-IV-1962 (T.C. Barr, Jr.). Types are deposited in the American Museum of Natural History, New York.

Diagnosis: A species of the *proximosetus* Group, distinguished from others by the characters noted in the key above.

Description of female: With the general features of the subgenus. Carapace a little longer than broad; anterior margin slightly concave in middle and with small denticles laterally; 4 weakly corneate eyes; chaetotaxy 6-4-4-2-4=20. Coxal chaetotaxy 2-2-1:2-1-CS;2-2:2-3:2-3; with 5-7 coxal spines on each coxa I. Abdominal tergal chaetotaxy of holotype 4:4:4:4:4:6:6:7:7:T2T:0; paratype 4:3:4:4:4:5:6:7:— . Sternal chaetotaxy of holotype 9:(4)6(4):(3)7(3):8:8:8:8:10:T1T2T1T:0:2; paratype similar.

Chelicera as long as carapace; with 9-13 setae on hand; fixed finger with about 10 teeth, movable finger with about 6 (some very worn); spinneret a slight elevation of the finger margin; flagellum of 8 pinnate setae.

Palp long and slender (Fig. 7); femur about 1.8 and chela about 2.55 times as long as carapace. Palpal femur 7.3-7.5, tibia 2.45-2.65, and chela 7.2-7.55 times as long as wide; hand 2.65 times as long as deep; movable finger about 1.75 times as long as hand. Arrangement of trichobothria typical. A short, sensory seta on medial side of fixed finger just proximad of level of *ist*. Fixed finger with 26-33 spaced, long, sharp macrodenticles and 19-20 pointed microdenticles alternating distally; movable finger with 17-20 spaced macrodenticles, 15 alternating microdenticles and 13-15 contiguous, low, rounded teeth proximally. Movable finger with small double sensillum near level of last macrodenticles. Proximal end of movable finger with a short, bifurcate process on dorsal side.

Legs slender; leg IV with entire femur 3.8 and tibia 6.1 times as long as deep.

Male: Unknown.

Measurements (mm): First figures are for holotype, with those for paratype in parentheses. Body length 2.13(2.10). Carapace length 0.725 (0.69). Chelicera 0.725(0.67) by 0.325(0.30). Palpal trochanter 0.37(0.355) by 0.185(0.185); femur 1.32(1.205) by 0.175(0.165); tibia 0.50(0.45) by 0.19(0.185); chela 1.88(1.75) by 0.25(0.245); hand 0.665(0.65) by 0.25 (0.245); movable finger 1.185(1.10) long. Leg IV: entire femur 1.03(0.96) by 0.27(0.25); tibia 0.73 by 0.12; metatarsus 0.37 by 0.10; telotarsus 0.85 by 0.07.

Etymology: The species is named *affinis* because of its obvious close relationship to *K. proximosetus*.

Remarks: The nearest neighbor species in the genus *Kleptochthonius* is *K. lutzi* Malcolm and Chamberlin from Cudjos Cave at Cumberland Gap, Lee County, Virginia, about 5 miles NW of English Cave and 12 miles NW of Chadwell's Cave. *K. lutzi* has a sensory seta on the fixed finger *distad* of the level of *ist*, and thus is not a member of the *proximasetus* Group.

Kleptochthonius (*Chamberlinochthonius*) *similis*, new species

Fig. 8

Material: Holotype female (WM 3844.01001) from Sweet Potato Cave, 6.5 miles ESE Rose Hill, Lee County, Virginia, 29-XI-1974 (T. Kane and T. VanZant). Deposited in the American Museum of Natural History, New York.

Diagnosis: A species of the *proximasetus* Group, with distinguishing characters as noted in the key above.

Description of female: With the general features of the subgenus. Carapace a little longer than broad; anterior margin slightly depressed in middle and with a few small denticles laterally; 4 weakly corneate eyes; chaetotaxy 6-4-4-2-4=20. Coxal chaetotaxy 2-2-1:3-1-CS:2-2:2-4:2-3; with 5 coxal spines on each coxa I. Abdominal tergal chaetotaxy 4:4:4:4:6:6:6:7:7:T2T:0; sternal chaetotaxy 9:(4)6(4):(3)7(3):8:7:8:8:9:T1T2T1T:0:2.

Chelicera slightly shorter than carapace; with 7 setae on hand; fixed finger with a row of 18 teeth, movable finger with 1 isolated distally and a row of 8; spinneret a very small elevation on the finger's edge; flagellum probably of 8 pinnate setae.

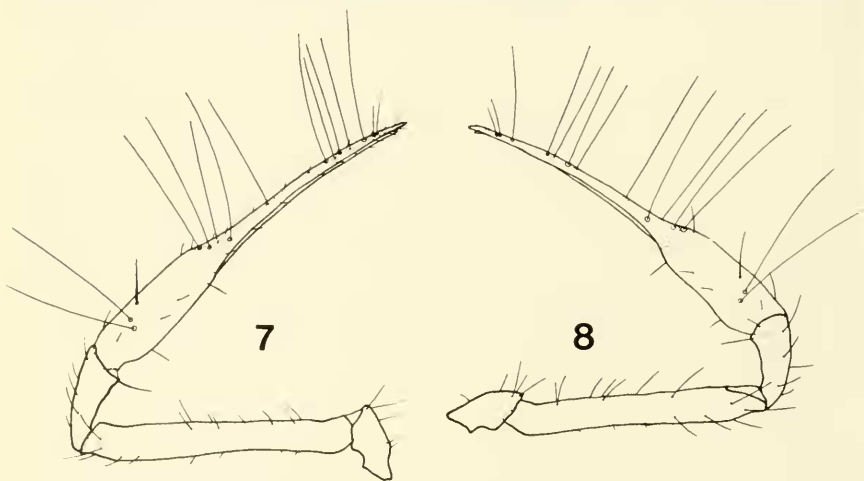


Fig. 7. *Kleptochthonius* (*C.*) *affinis*, new species. Dorsal view of left palp.

Fig. 8. *Kleptochthonius* (*C.*) *similis*, new species. Dorsal view of right palp.

Palp moderately long and slender (Fig. 8); femur 1.7 and chela 2.45 times as long as carapace. Palpal femur 7.45, tibia 2.5 and chela 6.95 times as long as wide; hand 2.6 times as long as deep; movable finger 1.64 times as long as hand. Arrangement of trichobothria typical. A short, sensory seta on medial side of fixed finger proximal of level of *ist*. Fixed finger with 29 spaced, long, sharp macrodenticles and 18 rounded microdenticles alternating distally; movable finger with 16 spaced macrodenticles, 15 alternating microdenticles and 15 contiguous low, rounded teeth proximally. Movable finger with a small double sensillum lateral to last macrodenticle. Proximal end of movable finger with a short, bifurcate process on dorsal side.

Legs rather slender; leg IV with entire femur 3.55 and tibia 5.45 times as long as deep.

Male: Unknown.

Measurements (mm): Body length 2.59. Carapace length 0.74. Chelicera 0.71 by 0.33. Palpal trochanter 0.38 by 0.19; femur 1.27 by 0.17; tibia 0.47 by 0.19; chela 1.81 by 0.26; hand 0.70 by 0.27; movable finger 1.15 long. Leg IV: entire femur 0.99 by 0.28; tibia 0.71 by 0.13; metatarsus 0.34 by 0.10; telotarsus 0.80 by 0.07.

Etymology: The species is named *similis* for its general resemblance to *K. regulus*.

Remarks: While *K. similis* is generally similar to *K. regulus*, the type locality, Sweet Potato Cave, is some 80 miles WSW of Fallen Rock Cave, the type locality of the latter. At the same time, the nearest neighbor, *K. proximosetus*, from which it differs considerably, is from Gallohan Cave, only a mile away.

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